

### **REMARKS**

Claims 1-27 were previously pending, of which claims 1, 8, 11, 14, 15, 21 and 22 have been amended, and claims 2-7, 9, 10, 12, 13, 16-20 and 23-27 remain in their original form. Reconsideration of presently pending claims 1-27 is respectfully requested in light of the above amendments and the following remarks.

#### **Claim Objections**

Claims 15-27 were objected to for informalities. Thus, the claims have been amended in accordance with the Examiner's suggestions. No new matter has been added.

#### **Allowable Subject Matter**

Claims 8 and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form. Claims 8 and 22 have been rewritten in independent form and are in condition for allowance.

#### **Rejections Under 35 U.S.C. §103**

Claims 1-3, 5-7, 9-10 and 12-14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yu, et al. (US Patent No. 6,350,639 hereinafter referred to as "Yu").

Claims 4 and 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yu in view of Tabara (US Patent No. 5,707,883 hereinafter referred to as "Yabara").

Claims 15-17, 23-24 and 26-27 were rejected under 35 U.S.C. §103(a) as being unpatentable over Satoh, et al. (US Patent No. 5,834,817 hereinafter referred to as "Satoh").

Claims 18 and 19 were rejected under 35 U.S.C. §103(a) as being unpatentable over Satoh in view of Quek (US Patent Publication No. 2004/0157397 hereinafter referred to as "Quek").

Claims 20 and 21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Satoh in view of Tabara.

Claim 25 was rejected under 35 U.S.C. §103(a) as being unpatentable over Satoh in view of Liaw (US Patent No. 5,807,779 hereinafter referred to as "Liaw").

Applicant traverses these rejections on the grounds that these references are defective in establishing a *prima facie* case of obviousness with respect to claims 1-7, 9-21, and 23-27.

Under MPEP § 2142, "[i]f the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness." It is submitted that, in the present case, the Examiner has not factually supported a *prima facie* case of obviousness for the following, mutually exclusive, reasons.

### **Independent Claim 1**

Amended claim 1 recites in part, "performing a second dry etch procedure having an isotropic etch component to remove portions of said tapered conductive gate structure comprised with said implanted ions resulting in a straight walled conductive gate structure, and resulting in said LDD region offset from edges of said straight walled conductive gate structure."

The Yu patent cannot be applied to reject amended claim 1 under 35 U.S.C. § 103. As provided in MPEP § 2143, "[t]o establish a prima facie case of obviousness,...the prior art reference (or references when combined) must teach or suggest all the claim limitations."

Specifically, Yu discloses an anisotropic procedure for etching the polysilicon gates 328, 330 having sloped sidewalls and using the patterned ARC mask 124, 126 to form polysilicon gates 358, 360 having substantially vertical sidewall profiles 359, 361. (See Yu, col. 11, lines 37-41; Figs. 4D & 4E). Furthermore, the Office Action stated that “Yu discloses anisotropic etching to form tapered and straight walled gate structures, but Yu does not disclose expressly dry etching.” Therefore, Yu does not teach or suggest all the claim limitations recited in amended claim 1. For this mutually exclusive reason, the Examiner’s burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

Additionally, the Yu reference, by providing an anisotropic etching procedure to form polysilicon gate structures with vertical sidewalls, clearly teaches away from claim 1, recited above. Prior art that teaches away from the claimed invention cannot be used to establish obviousness. Thus, for this reason alone, the Examiner’s burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

### **Independent Claim 15**

Amended claim 15 recites in part, “performing a second dry etch procedure using said mask shape as an etch mask to define a polysilicon gate structure from said polysilicon layer, wherein said polysilicon gate structure is comprised with a top portion featuring vertical sides, and comprised with a bottom portion featuring notches or voids at polysilicon – gate insulator layer interface, with said notches in said bottom portion of said polysilicon gate structure exposing a first portion of said semiconductor substrate while non-notched area of said bottom portion of said polysilicon gate structure is located overlying a second portion of said semiconductor substrate...wherein said second dry etch procedure uses an etch chemistry that

causes deflection of a dry etchant at said polysilicon – gate insulator layer interface and results in said notches or voids at said bottom portion of said polysilicon gate structure.”

The Satoh patent cannot be applied to reject amended claim 15 under 35 U.S.C. § 103. As provided in MPEP § 2143, “[t]o establish a prima facie case of obviousness,...the prior art reference (or references when combined) must teach or suggest all the claim limitations.”

For instance, Satoh discloses forming a resist mask 11 on top of the polysilicon layer 3 and performing a first etch step under normal conditions for a limited amount of time. This results in formation of the upper portion 3b of the shaped polysilicon layer serving as the gate electrode. Moreover, an organic polymer from the resist 11 material adheres on the sidewalls of the etched layer during the first etch step. This adhesion layer 3c acts a protective layer for subsequent etching steps and thus, etching of the upper portion 3b in the transverse direction is inhibited. The use of an inclined silicon dioxide insulating film 2 is advantageous when a wedge-shaped lower portion 3a in the shaped polysilicon layer is desired. (See Satoh, col.7, lines 19-31; Figs. 6B, 6C, & 6D).

In contrast, the Present Application discloses a second dry etch procedure that uses an etch chemistry that causes deflection of dry etchants from the surface of the gate insulator layer and thus, removes portions of the gate structure at the polysilicon – gate insulator layer resulting in a notched or necked region. (See Present Application, par. [0021]). Thus, for this mutually exclusive reason, the Examiner’s burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

Additionally, the Satoh reference, by providing a resist mask and a resulting adhesion layer as protection for the upper portion of the polysilicon gate structure to form the notched or neck region at the lower portion, clearly teaches away from claim 15, recited above. Prior art that teaches away from the claimed invention cannot be used to establish obviousness. Thus, for this

reason alone, the Examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

**Dependent Claims: 2-7, 9-11, 16-21, and 23-27**

The Applicant submits that the rejection of the following dependent claims should also be withdrawn for the following mutually exclusive reasons.

Claims 2-7, 9-10, and 12-14 Claims 2-7, 9-10, and 12-14 depend from and further limit claim 1 and should be allowable for at least the same reasons set forth above for claim 1.

Claim 11 Claim 11 depends from and further limits claim 1 and should be allowable for at least the same reasons set forth above for claim 1.

Additionally and independently, Applicant traverses the rejection as, per MPEP § 2143; “[t]o establish a *prima facie* case of obviousness,...the prior art reference (or references when combined) must teach or suggest all the claim limitations.” Claim 11 recites that the “second dry etch procedure is an RIE procedure performed at a power between about 800 to 1000 watts, and at a pressure between about 50 to 100 mtorr, using Cl<sub>2</sub>, HBr, O<sub>2</sub>, and N<sub>2</sub> as etchants.” Applicant submits that Yu combined with Tabara does not teach this element. As stated in the Office Action, Yu discloses anisotropic etching, but Yu does not disclose wherein the second etch procedure is a reactive ion etch (RIE) procedure. Tabara discloses anisotropic dry etching process for polysilicon using a gas containing Cl<sub>2</sub> or HBr and an anisotropic RIE procedure to form sidewall spacers. Applicant traverses the position that it would have been obvious to perform the same RIE procedure for the sidewall spacers to obtain the shaped polysilicon.

In Tabara, the sidewall spacers 21 are formed over gate electrodes 14 (polysilicon) that already have vertical sides and thus, an anisotropic RIE procedure is performed . (See Tabara, col. 7, lines 33-36; Fig. 9J). In the present application, the "RIE procedure performed at a power between about 800 to 1000 watts, and at a pressure between about 50 to 100 mtorr, using Cl<sub>2</sub>, HBr, O<sub>2</sub>, and N<sub>2</sub> as etchants," establishes a desired isotropic etch component to trim the tapered sidewalls of the gate structure and forms a gate structure with vertical sides. (See Present Application, par. [0018]; Figs. 4 & 5). Therefore, Yu combined with Tabara does not teach nor suggest all the limitations of claim 11 and the rejection should be withdrawn.

Claim 16-21 and 23-27 Claims 16-21 and 23-27 depend from and further limit claim 15 and are allowable for at least the same reasons as set forth above for claim 15.

**Conclusion**

It is clear from all of the foregoing that independent claims 1, 8, 15, and 22 are in condition for allowance. Dependent claims 2-7, 9-14, 16-21, and 23-27 depend from and further limit independent claims 1 and 15, and therefore are allowable as well.

An early formal notice of allowance of claims 1-27 is requested. The Examiner is invited to call the undersigned at the below-listed number if a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,



David M. O'Dell  
Registration No. 42,044

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HAYNES AND BOONE, LLP  
901 Main Street, Suite 3100  
Dallas, Texas 75202-3789  
Telephone: 972/739-8635  
Facsimile: 214/200-0853  
Client Matter No.: 2003-0375/24061.518  
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